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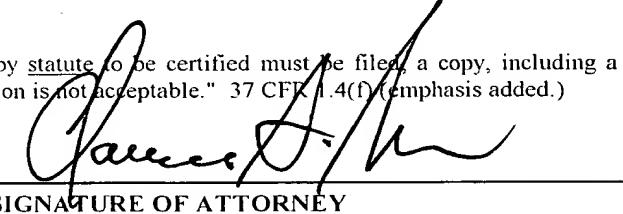
For: A UTILITY METERING SYSTEM INCORPORATING A TRANSACTION  
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Attached please find the certified copy of the foreign application from which priority is claimed for this case:

Country : United Kingdom  
Application Number : 0012392.7  
Filing Date : 22 May 2000

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JME/P14784GB

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22 MAY 2000

3. Full name, address and postcode of the or of  
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11/77 25/5/00

Patents ADP number (if you know it)

7902265001

If the applicant is a corporate body, give the  
country/state of its incorporation

4. Title of the invention

A utility metering system incorporating a transaction  
authorisation system

5. Name of your agent (if you have one)

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67004

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Mr Jonathan Exell  
01732 458881

# A UTILITY METERING SYSTEM INCORPORATING A TRANSACTION AUTHORISATION SYSTEM

## Field of the Invention

5 The present invention relates to a utility metering system, which incorporates a transaction authorisation system for secure authorisation of transactions and, in particular financial transactions.

## Background to the Invention

10 Fraud is increasing dramatically for "card not present" credit card transactions. In such transactions, business is typically effected remotely, e.g. by Telephone or Internet Shopping. The purchaser discloses his or her name, credit card number and expiry date in order for the credit card to be charged for a product or service. These sorts of transactions are different to "card present" transactions at Electronic  
15 Point-of-Sale Terminals or the like, where both the cardholder (purchaser) and the card are required to be physically present. The purchaser is required to sign an authorisation to permit a transaction to be charged against that card's account. The merchant is accountable for the verification and authentication of the card and the validation of the cardholder's identity.

20

By the fact that:

1. A recognisable card is presented
2. Identification, Authorisation and Entitlement processes are enforced
3. The location of the transaction is legitimate

25 Then the transaction qualifies as a "card present" transaction.

Typically in "card not present" transactions it is not possible to verify the identity of the purchaser and the validity of the "card". Anybody knowing the information contents of a valid credit card can make purchases and charge that card account with "card not present" transactions. The purchaser need not even have the card. Another a common fraudulent practice is to acquire discarded credit card receipts, which contain the necessary account information, to create fraudulent "card not present" transactions. In order to avoid this, some merchants will only deliver to the address registered with the customer's credit card issuer (usually a Financial Institution).

More recently, computer programs have been developed and made available on the Internet that successfully generate random credit card numbers.

One particular area where the use of credit cards is increasing exponentially is on the 5 World Wide Web in e-commerce E-Tailer websites and the like. Whilst credit and debit cards are currently the only feasible ways for such sites to be paid for their products or services, the lack of security of transactions across the Internet, even if encrypted, has resulted in many financial problems and privacy concerns. Because transactions can be intercepted or monitored, unscrupulous persons are obtaining 10 credit card numbers and fraudulently using them for other purchases. The level of security of websites varies considerably and many sites have found themselves being attacked for the contents of their databases containing credit card details.

In response to the potential and actual problems, the international bodies responsible 15 for credit cards, including VISA and MasterCard, have introduced premium charges associated with "card not present" transactions. As these premiums are not normally charged on "card present" transactions, the vendor, who is competing with traditional vendors using point-of-sale "card present" transactions, has to bear a substantial overhead; this reduces his profit margin in order to remain competitive. The main 20 reason that the international card issuing bodies claim that the premiums are justified is that a consumer can claim against a credit card issuer if the order is not properly fulfilled. Equally, where there is a dispute over a "card not present" transaction, such as the validity of the amount charged, authenticity of the transaction or proven receipt of goods the rules favour the consumer against the merchant. The merchant is 25 accountable for all costs for transactions in dispute. In addition, in order to cover themselves against losses and overheads from dealing with these fraudulent transactions the card issuers add a premium to the merchant discount rate, as a form of insurance.

30 **Statement of Invention**

According to one aspect of the present invention, there is provided a transaction authorisation system comprising a user interface unit capable of accepting a transaction authorisation and a utility meter provided at a location having an associated location identifier unique to the location, wherein the utility meter is

arranged to communicate with the user interface unit, to obtain a transaction authorisation, and to securely transmit the transaction authorisation and location identifier as an authorisation request for authorisation of the transaction.

- 5 Utility meters must be fixed at, or very close to, the location to be metered because they need to measure the supply of the utility as it enters the location. Taking advantage of the fact that an installed meter is virtually immovable, that the meter has an embedded unique and secure identifier that identifier satisfies criterion 3 (the location of the transaction is known) and meets "card present" requirements. The user interface unit enables the user (the purchaser) to confirm their identity and to prove that the card is present by inputting a transaction authorisation (such as by entering the card in a card reader and providing an authorisation code), therefore satisfying criteria 1 and 2. The transaction authorisation can be securely communicated to the financial institutions for fulfilment and settlement as a legitimate "card present" transaction.
- 10
- 15

Preferably, the transaction authorisation system includes a communication unit, which communicates with an authorisation authority, wherein the utility meter is arranged to submit the authorisation request to the communication unit for transmission to the authorisation authority. Preferably, the utility meter is arranged to submit utility usage data to the communication unit.

Further utility meters may be provided at the location, wherein said further utility meters may be arranged to submit utility usage data to the communication unit. The further utility meters may be arranged to submit the utility usage data to said utility meter for submission to the communication unit.

The further meters may include gas and water meters. Preferably, the utility meter is an electricity meter.

30 The communication unit may be arranged to communicate utility usage data to a utility supplier. The communication may be direct or may be via a central control system. The authorisation authority may comprise a central control system, wherein

the central control system is configured to process communicated authorisation requests and to submit the requests to appropriate banking authorities for fulfilment.

The communication unit may be a modem.

5

The user interface unit and the utility meter may communicate with each other via RF signals. The communication unit and the utility meter may communicate with each other via RF signals. The further utility meters may communicate via RF signals.

- 10 The user interface unit may include a card reader device, wherein the card reader device is arranged to read data from a card to be charged for the transaction, the user interface unit being responsive to process the data from the card to form at least a part of a transaction authorisation. The user interface unit may include a keypad, wherein the user interface unit is arranged to accept a code entered via the keypad to form at least a part of a transaction authorisation.
- 15

- 20 The utility meter may include a memory for securely storing a user's bank account data, wherein the user interface unit is arranged to accept an input from the user authorising use of at least part of the banking data to form at least a part of a transaction authorisation.

The user interface unit may include a display, wherein the user interface unit is arranged to display on request utility usage data from the utility meter.

- 25 The user interface unit may be connectable to a computer, wherein the user interface unit, when connected to a computer, is operative to make necessary transaction authorisation requests in response to electronic transactions initiated on the computer.

- 30 Preferably the transaction is a financial transaction. Preferably the user interface device is remote from the utility meter. Most preferably the user interface unit is a hand held device.

The system may comprise a digital cellular transceiver arranged to communicate with the utility meter for transmitting data to, and receiving data, from a remote source.

The transceiver may be the communication unit. The system may further comprise a switching unit controllable by the energy supplier for switching appliances on and off, wherein when the utility meter receives a signal via the transceiver indicating the availability of cheap-rate energy it is arranged to control the switching unit, or send 5 equivalent signals to a locally associated unit.

According to another aspect of the present invention, there is provided a method of making a transaction using the transaction authorisation system described above, the method comprising the steps of requesting goods or services for which payment is 10 required and entering a transaction authorisation via a user interface unit, wherein the transaction authorisation is communicated by the utility meter to effect payment for the transaction either on-line or off-line.

According to another aspect of the present invention, there is provided an energy 15 supply system including a utility meter, a switching unit controllable by the utility meter for switching appliances on and off and a digital cellular transceiver provided at a location, the utility meter having an associated location identifier unique to the location, the utility meter being arranged to communicate with a remote communication unit via the transceiver, the remote communication unit having a 20 database of the unique identifiers and transceiver numbers, wherein the remote communication unit is arranged to communicate the availability of cheap-rate energy to the utility meter via the transceiver, wherein, upon receipt of such a communication, the utility meter is arranged to control the switching unit to switch appliances on.

25 By being able to selectively communicate with utility meters, surplus energy generated during off-peak periods can be utilised by energy storage devices such as off-peak heaters.

30 According to a further aspect of the present invention, there is provided a pre-payment energy supply system including a pre-payment utility meter, and a digital cellular transceiver provided at a location, the utility meter having an associated location identifier unique to the location and a memory for storing pre-payment credits, the utility meter being arranged to communicate with a remote communication unit via

the transceiver, the remote communication unit having a database of the unique identifiers and transceiver numbers, wherein a payment for crediting to a meter includes the unique identifier, the remote communication unit being arranged to determine the transceiver number from the unique identifier, to communicate with the utility meter via the transceiver and to add appropriate pre-payment credits to the memory.

#### **Brief Description of the Drawings**

Examples of the present invention will now be described in detail, with reference to 10 the accompanying drawings in which:

Figure 1 is a schematic diagram of a system according to one aspect of the present invention;

Figure 2 is the schematic diagram of the system of Figure 1 including features according to a preferred aspect of the present invention;

15 Figure 3 is the schematic diagram of the system of Figure 2 illustrating a number of additional aspects of the present invention.

Figure 4 is a schematic diagram of a system according to another aspect of the present invention; and

20 Figure 5 is the schematic diagram of Figure 4 incorporating further aspects of the present invention.

#### **Detailed Description**

Figure 1 is a schematic diagram of a system according to one aspect of the present invention. A utility metering system includes a utility meter 10 provided at a location 25 to be metered. The utility meter 10 is coupled to the utility supply and is arranged to provide the features and functions of a standard utility meter including a utility usage display. Preferably, the utility meter 10 is an electricity meter. A communication unit 20 is also provided at the location and is able to accept utility usage data from the utility meter and communicate the utility usage data to a utility supplier. A user 30 interface unit 30 communicates with the utility meter 10 and is able to enter and display utility information upon request. This may include utility payments to a utility company from a deposit account or consumption, tariff, time, power interruption and payments history information. If the meter is configured to be a pre-

pay meter, the credit balance and emergency credit information may also be displayed.

Figure 2 is the schematic diagram of the system of Figure 1 including features 5 according to a preferred aspect of the present invention. The utility meter 10 has an identification code unique to the location embedded within it. The utility meter also includes a transaction processing system 15. The user interface unit 30 includes a card reader device 35, display 36 and keypad 37.

- 10 10 A user starts a transaction for goods or services, for example over the Internet by telephone. Upon making an order or requesting a service, the user is provided with a transaction code and is requested to arrange payment. At the location, the user enters the transaction code into the user interface unit 30 via the keypad 37 and is then requested via prompts on the display 36 to provide details of a payment account to be charged and to authorise payment of the transaction. The user inserts a credit or debit card into the card reader device 35, which obtains the necessary card details including card number and expiry date. The user then enters an authorisation code associated with the card via the keypad 37. The user interface unit 30 communicates with the utility meter 10 and passes the transaction code and card data to the utility meter 10.
- 15 20 These are combined at the utility meter 10 with the identification code to form an authorisation request. The authorisation request is encrypted. The transaction processing system 15 of the utility meter 10 establishes communication with the communication unit 20 and controls the communication unit 20 to establish communication with an authorisation authority 40. The encrypted authorisation request is then communicated via the communication unit 20 to the authorisation authority 40 which processes the authorisation request as a "card present" type transaction and arranges payment of the transaction on the user's card account. Utility usage bills may also be paid in this way, the user authorising payment via the user interface unit 30. The system may be programmed such that utility bills are
- 25 30 automatically paid via a predetermined credit card or payment deposit account without user intervention after the initial set-up. In the case of pre-payment utility meters, credit may be purchased via the user interface unit 30 in the manner described above.

Figure 3 is the schematic diagram of Figure 2 illustrating a number of additional aspects of the present invention. Further utility meters 50 and 60 are provided at the location and are adapted to communicate further utility usage data to the utility meter 10. Preferably the further utility meters 50, 60 are for gas and water respectively.

5      The utility meter 10 is configured to communicate the further utility usage data to the appropriate utility supplier via the communication unit 20. The user interface unit 30 is configured to communicate with the further utility meters 50, 60 and to display utility usage and charging information upon request.

10     Instead of, or in addition to, the card reader device 35, the utility meter 10 may be provided with a memory device 16 in which a user's bank account data is stored. In place of providing a card to be charged for a transaction, the user may authorise the utility meter to release some of the banking data for the purpose of charging. The user's computer 70 may also be adapted or arranged to communicate with the user

15     interface unit 30 via a serial port connection, USB, infra red, BlueTooth or the like. Communication between the computer 70 and user interface unit 30 allows the transaction data for an online transaction to be automatically communicated to the user interface unit 30 without the user's intervention. Furthermore, utility usage data, transaction data and the like could be communicated from the utility meter 10 to the

20     computer 70 via the user interface unit 30 for storage or analysis.

A set-top box 80 connected to a television 90 may also be provided at the location. The set-top box 80 may operate in a similar manner to the computer 70, communicating with the user interface unit 30 for authorisation of transactions made

25     via the set-top box. Additionally, the set-top box 80 may allow the whole system to be managed, for data to be added and updated and for transactions reviewed via communication with and/or control from the user interface unit 30. Furthermore, it is possible that the set-top box 80, television 90 and television remote control (not shown) can act in place of the user interface unit 30. If necessary, a card reader could

30     be provided in the remote control or the smart card reader commonly included in set-top boxes could be utilised.

It is preferred that each utility meter (10, 50, 60), the user interface unit 30 and the communication unit 20 each include an RF communication device, thereby forming a

localised Pico-network. Communication is via secure, low power radio transmissions. If RF communication is not feasible, cables or other connection mechanisms may be used. The communication unit 20 is likely to be a modem transparently connected to the PSTN between the user's telephone and telephone socket. Obviously, the 5 communication unit could operate via ISDN and could be integrated into the utility meter subject to a telephone socket being close to the meter. Further communication mechanisms such as GSM or cable connecting are equally feasible and other mechanisms could be employed as and when they become available without any technical difficulty.

10

The utility meter 10 is preferably configured to be able to alert the authorisation authority 40 or some other predetermined online services provider via the communication unit 20 if the operation of the network-network fails or if one of the system components fails completely or fails to pass a predetermined test. In 15 particular, gas and water meters may be configured to issue an alert upon detection of a leak. The utility meter is preferably configured to communicate with the authorisation authority 40 to inform it of power failures and interruptions in service. Fault and service failure information could be used to determine whether the equipment has been tampered with and whether further investigation is necessary. 20 Where tampering is suspected authorisation requests containing the meter's identification code would no longer be allowed.

In order to reduce communication between utility meters and the authorisation authority, the utility meter 10 may be arranged to retrieve and communicate utility usage data on a regularly scheduled but variable interval (such as monthly) basis at a predetermined time. The data may be verified, aggregated and then delivered to the appropriate energy supplier or the like. Whilst connected, the utility meter may download new data and/or parameter changes such as new tariffs, a new dial-in time or marketing messages. Additionally, new software for the meter 10 or user interface 25 unit 30 may be automatically downloaded.

Each user may be given an authorisation code to access the user interface unit 30. The personal access code may serve to allow the user to his or her own data stored in the system and only to use cards and data associated with him or her. Optionally, a

“super user” may be nominated for the location having the authority to restrict others from access or certain types of transactions, authorise new personal access codes and generally monitor the system. A number of user interface units 30 may be used in the location at once. Where other utility meters are adapted to forward utility usage 5 information to utility meter 10, these are preferably arranged to communicate this information at least 24 hours. Communication between the user interface unit 30 and the utility meter 10 and the communication unit 20 occurs as and when necessary.

Whilst the processing and composition of an authorisation request is performed at the 10 utility meter 10 in the above described embodiment, it is equally possible that the identification code is obtained from the utility meter 10 by the user interface unit 30, combined with the card data, transaction code and authorisation code, encrypted and then communicated to the utility meter 10. At the utility meter 10, any necessary data 15 packeting and the like are performed prior to transmission. Encryption algorithms such as DES, RSA or any other available mechanism may be used.

Figure 4 is a schematic diagram of a system according to another aspect of the present invention. The utility meter 10 includes a number of controllable switches 13 and a transceiver 14. The switches 13 are connected to appliances that are capable of 20 storing energy for later use. In particular, these may include electric storage heaters 100 and hot water storage systems 110. The transceiver 14 is configured to be able to send and receive data via a digital cellular network 120.

The utility meter operates substantially as has been described with reference to the 25 previous Figures with the exception that communication is via the transceiver 14 instead of a communication unit 20.

During low electrical power consumption periods, an electricity supplier 130 can selectively call the transceivers 14 using the digital cellular network 120 and offer 30 reduced-rate electrical power. The utility meter 10 is able to determine, via the switches 13, whether there are appliances (100, 110) with capacity for accepting the power. If so, the utility meter communicates acceptance to the electricity supplier 130 and switches on the appliances (100, 110) via the switches 13.

Figure 5 is a schematic diagram of the system of Figure 4 incorporating further aspects of the present invention. Where a utility meter 10 is configured as a pre-pay meter, the location is also provided with an identification card. The identification card carries the unique identification code embedded within the utility meter 10 and 5 allows somebody to credit pre-payments to the meter 10 remotely. On visiting a bank, supermarket or other facility offering pre-payment facilities 210, someone possessing the card can present it along with a pre-payment in order for the meter to be credited. Data from the card is obtained at the pre-payment facilities 210 by reading the card using a card reader. From the data, the unique identification code is 10 obtained and communicated, along with the amount of pre-payment received, to a central communication unit 220.

The communication unit 220 includes a database 230 of the unique identification codes cross-referenced with the digital cellular network number for the transceiver for 15 the meter having that code. The code received from the pre-payment facility is cross-referenced in the database 230 and the digital cellular number is obtained. The communication unit 220 communicates with the meter 10 via the digital cellular network 120 and instructs it to credit the amount pre-paid.

20 A pre-payment transaction does not have to be done by the occupant of the location and could be performed by other parties, including Government Agencies. In addition, the system could be configured such that pre-payment could be made from the home via the user interface unit 30 in the same manner as a regular financial transaction is made.

25

Since the utility meter is in affixed place it provides a unique identification key that 30 "passports" all other intelligent devices within the location. The utility meter can use its unique electronic identity and its "fixed place" location to log the activity of all related Pico-net devices

Whilst a number of different combinations of features have been described with reference to different embodiments of the present invention, the skilled person will appreciate that all the features described are complimentary and could be combined in

different combinations to those specifically described without any technical difficulty.

**Claims**

1. A transaction authorisation system comprising:  
a user interface unit capable of accepting a transaction authorisation; and,  
5 a utility meter provided at a location having an associated location identifier unique to the location,  
wherein the utility meter is arranged to communicate with the user interface unit, to obtain a transaction authorisation, and to transmit the transaction authorisation and location identifier as an authorisation request for authorisation of the transaction.  
10
2. A transaction authorisation system according to claim 1, further comprising a communication unit which communicates with an authorisation authority, wherein the utility meter is arranged to submit the authorisation request to the communication unit for communication to the authorisation authority.  
15
3. A transaction authorisation system according to claim 2, in which the utility meter is arranged to submit utility usage data to the communication unit.  
20
4. A transaction authorisation system according to claim 2 or 3, comprising a further utility meter provided at the location, wherein said further utility meter is arranged to submit utility usage data to the communication unit.  
25
5. A transaction unit according to claim 4, in which said further utility meter is arranged to submit the utility usage data to said utility meter for submission to the communication unit.  
30
6. A transaction authorisation system according to claim 4 or 5, in which said further meter is a gas or water meter.
7. A transaction authorisation system according to any preceding claim, in which the utility meter is an electricity meter.

8. A transaction authorisation system according to any of claims 3 to 7, in which the communication unit is arranged to communicate utility usage data to a utility supplier.

5 9. A transaction authorisation system according to any of claims 3 to 7, in which the communication unit communicates with one or more utility suppliers via a central control system.

10 10. A transaction authorisation system according to claim 2, in which the authorisation authority comprises a central control system, wherein the central control system is configured to process communicated authorisation requests and to submit the requests to appropriate banking authorities for fulfilment.

15 11. A transaction authorisation system according to any of claims 2 to 10, in which the communication unit is a modem.

12. A transaction authorisation system according to any preceding claim, in which the user interface unit and the utility meter communicate with each other via RF signals.

20 13. A transaction authorisation system according to any of claims 2 to 10, in which the communication unit and the utility meter communicate with each other via RF signals.

25 14. A transaction authorisation system according to claim 4 or 5, in which the further utility meter communicates via RF signals.

30 15. A transaction authorisation system according to any preceding claim, in which the user interface unit includes a card reader device, wherein the card reader device is arranged to read data from a card to be charged for the transaction, the user interface unit being responsive to process the data from the card to form at least a part of a transaction authorisation.

16. A transaction authorisation system according to any preceding claim, in which the user interface unit includes a keyboard, wherein the user interface unit is arranged to accept a code entered via the keyboard to form at least a part of a transaction authorisation.

17. A transaction authorisation system according to any preceding claim, in which the utility meter includes a memory for storing a user's banking data, wherein the user interface unit is arranged to accept an input from the user authorising use of at least part of the banking data to form at least a part of a transaction authorisation.

18. A transaction authorisation system according to claim 1, 3 or 5, in which the user interface unit includes a display, wherein the user interface unit is arranged to display on request utility usage data from the utility meter.

19. A transaction authorisation system according to any preceding claim, in which the user interface unit is connectable to a computer, wherein the user interface unit, when connected to a computer, is operative to make necessary transaction authorisation requests in response to electronic transactions initiated on the computer.

20. A transaction authorisation system according to any preceding claim, in which the transaction is a financial transaction.

21. A transaction authorisation system according to any preceding claim, in which the user interface device is remote from the utility meter.

22. A transaction authorisation system according to any preceding claim, further comprising a digital cellular transceiver arranged to communicate with the utility meter for transmitting data to, and receiving data, from a remote source.

23. A transaction authorisation system according to claim 22 when dependent on claim 2, in which the transceiver is the communication unit.

24. A transaction authorisation system according to claim 22 or 23, further comprising a switching unit controllable by the utility meter for switching appliances on and off, wherein when the utility meter receives a signal via the transceiver indicating the availability of cheap-rate energy it is arranged to control the switching unit to switch appliances on.

10 25. A method of making a transaction using the transaction authorisation system of any preceding claim, comprising the steps of requesting goods or services for which payment is required and entering a transaction authorisation via a user interface unit, wherein the transaction authorisation is communicated by the utility meter to effect payment for the transaction.

15 26. An energy supply system including a utility meter, a switching unit controllable by the utility meter for switching appliances on and off and a digital cellular transceiver provided at a location, the utility meter having an associated location identifier unique to the location, the utility meter being arranged to communicate with a remote communication unit via the transceiver, the remote communication unit having a database of the unique identifiers and transceiver numbers, wherein the remote communication unit is arranged to communicate the availability of cheap-rate energy to the utility meter via the transceiver, wherein, upon receipt of such a communication, the utility meter is arranged to control the switching unit to switch appliances on.

25 27. A pre-payment energy supply system including a pre-payment utility meter, and a digital cellular transceiver provided at a location, the utility meter having an associated location identifier unique to the location and a memory for storing pre-payment credits, the utility meter being arranged to communicate with a remote communication unit via the transceiver, the remote communication unit having a database of the unique identifiers and transceiver numbers, wherein a payment for

crediting to a meter includes the unique identifier, the remote communication unit being arranged to determine the transceiver number from the unique identifier, to communicate with the utility meter via the transceiver and to add appropriate pre-payment credits to the memory.

Fig. 1

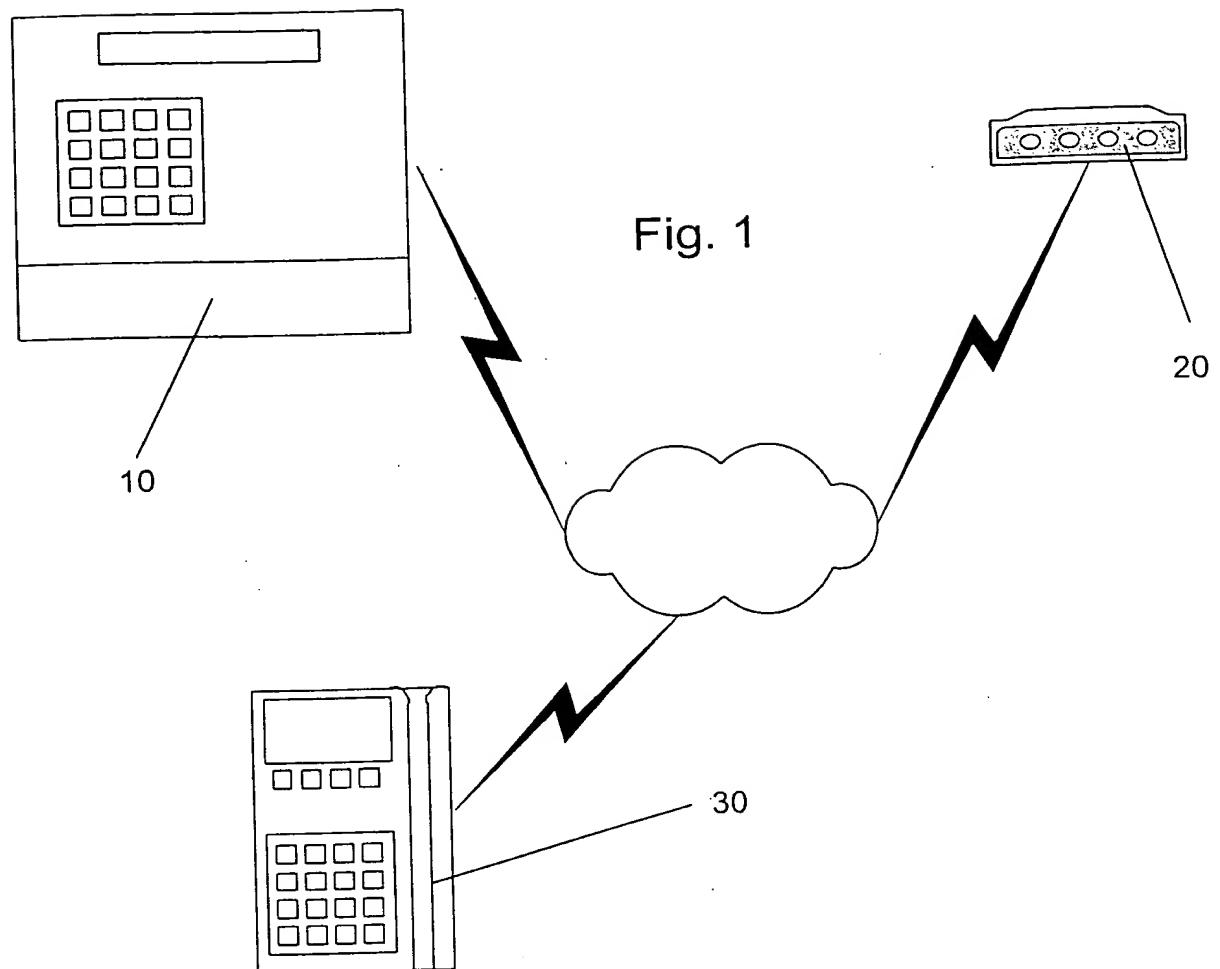


Fig. 2

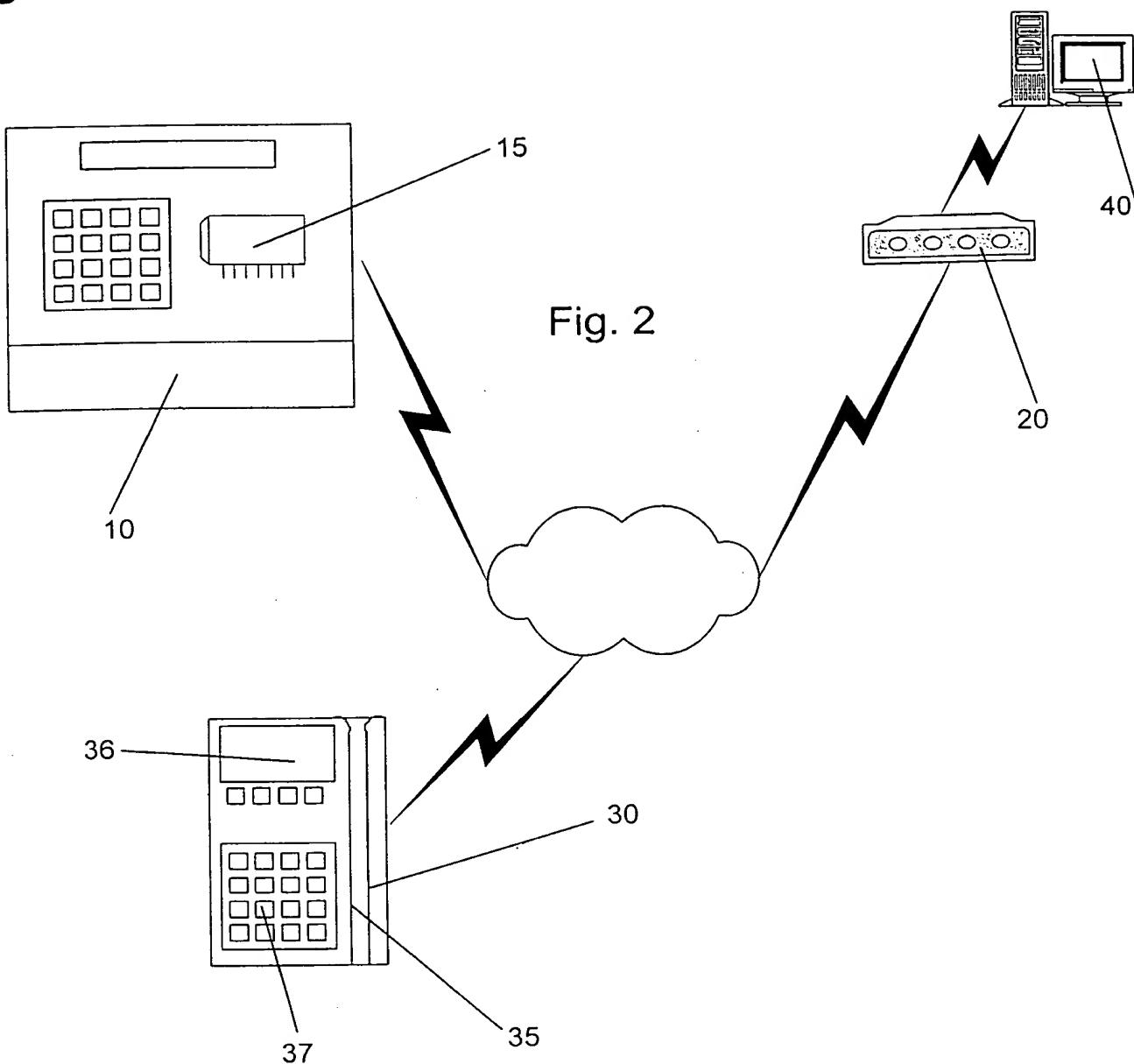
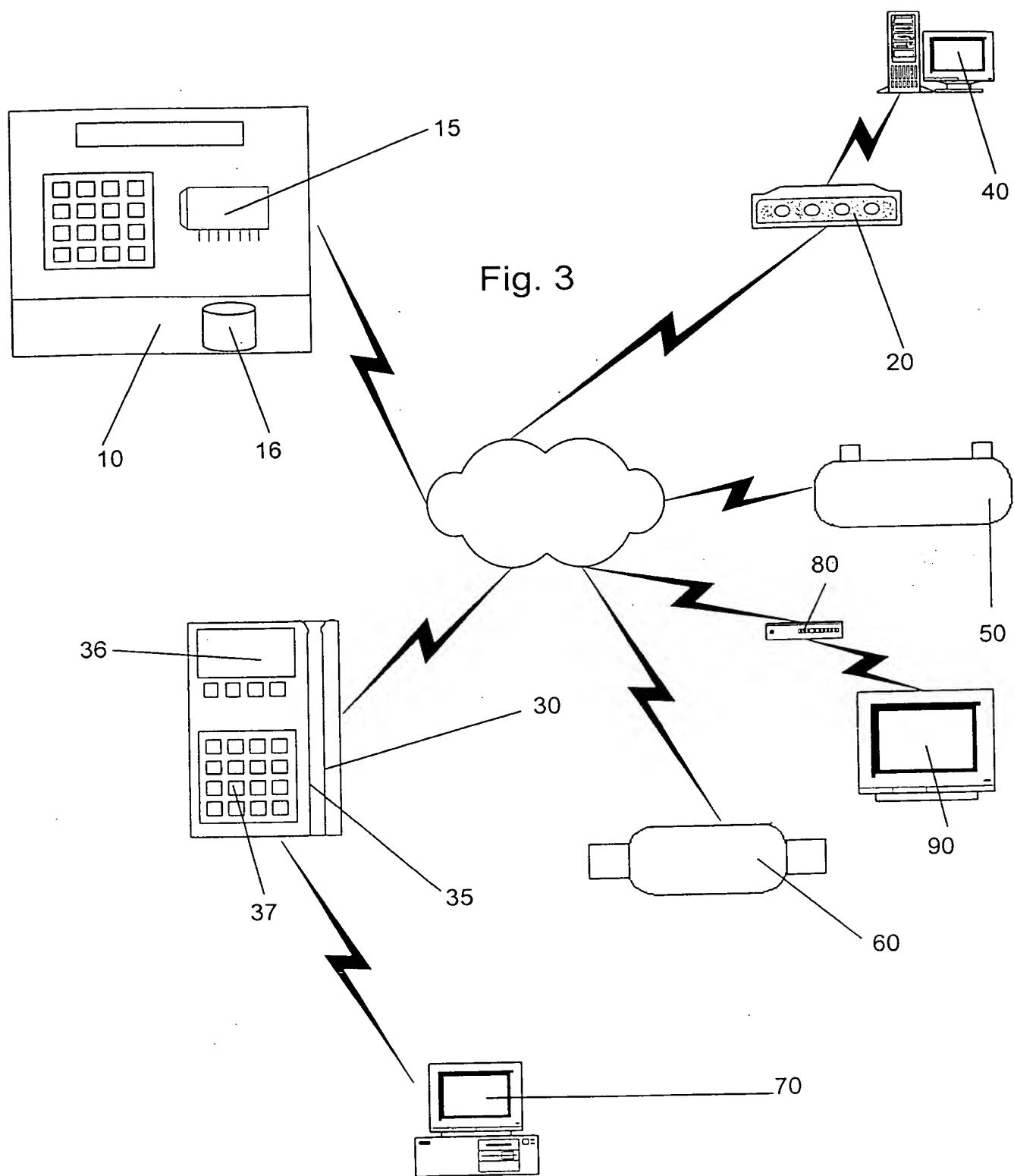


Fig. 3



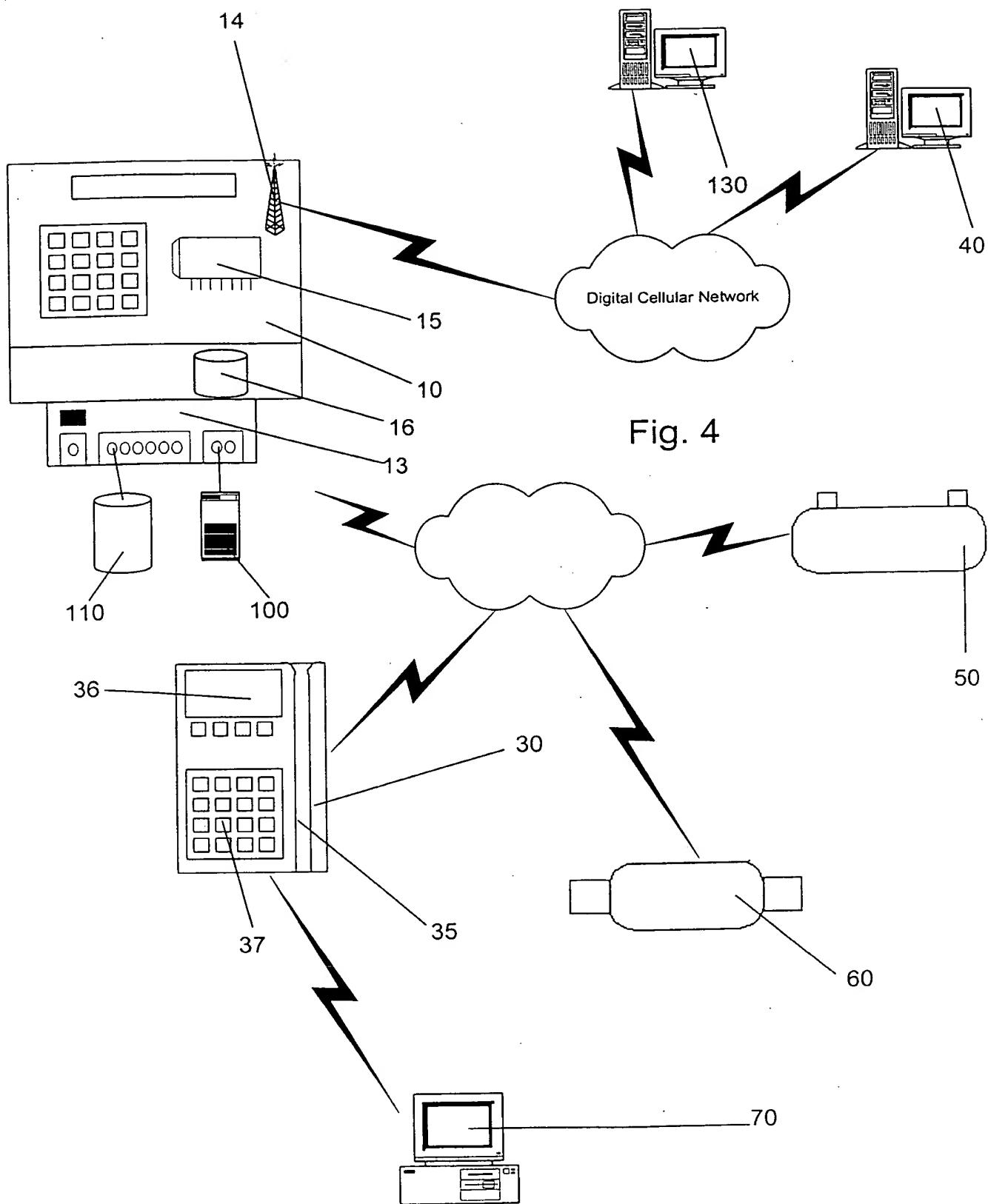


Fig. 4

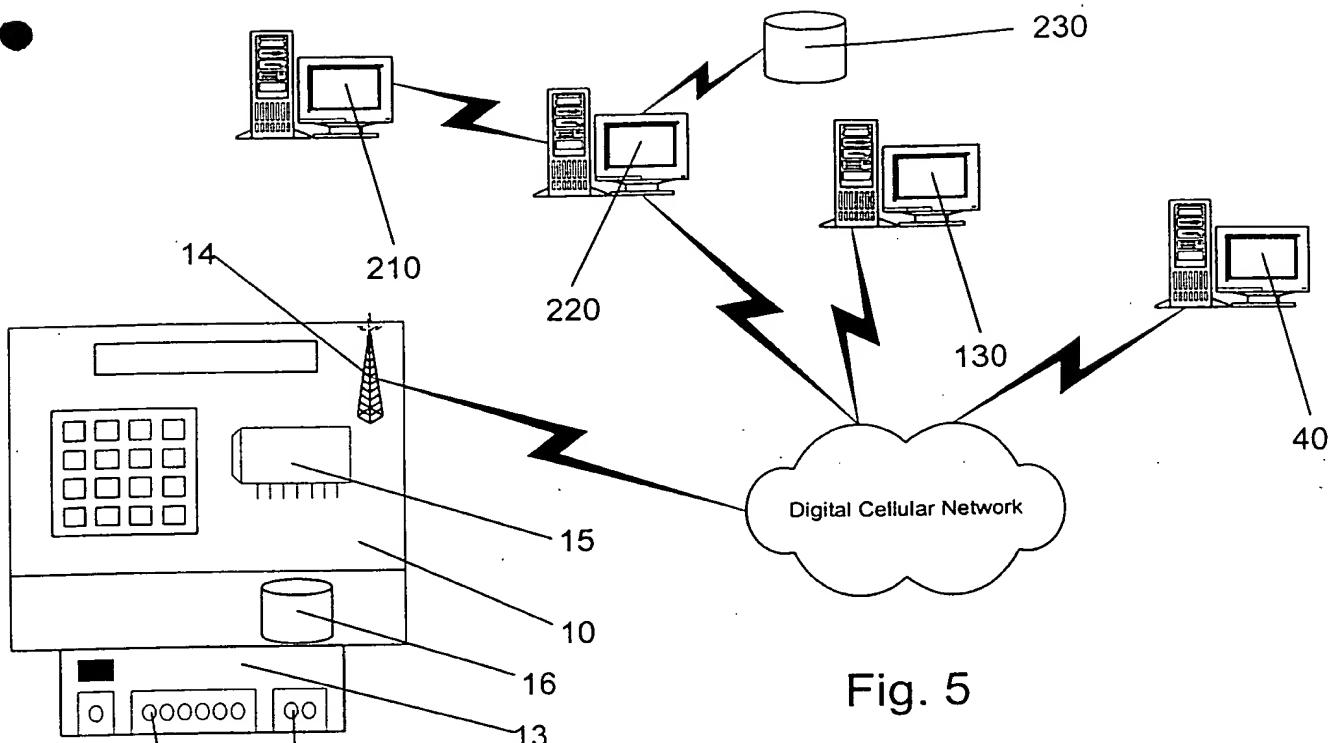


Fig. 5

